CHAPTER 6

QUALITY ASSURANCE

As you progress up the ladder of responsibility as an Electronics Technician, you will become more involved in the field of quality assurance (QA). As an ET1 or ETC, you will be responsible for ensuring that the work performed by your technicians and by outside help is completed with the highest quality possible. Most of the personnel in the ET rating take pride in the performance of their jobs, and they normally strive for excellence. However, every individual has an occasional off day. For example, your best technician may have had the midwatch the previous night. When an individual is tired and not 100 percent alert, oversights or mistakes are easy to make. One of your many responsibilities as the work group or work center supervisor will be to ensure that all corrective action performed is done correctly and meets prescribed standards. Improper performance of repairs or installations could endanger an expensive piece of equipment or cause another piece of equipment to fail prematurely. A well-organized QA and inspection program will minimize the impact of a moment of carelessness or inattention. In this chapter we will familiarize you with the purpose, basic organization, and mechanics of the quality assurance (QA) program.

You may be assigned as a QA representative or collateral duty inspector from time to time. As a work center supervisor, you will be responsible for the quality control program in your workspaces. It is important that you become quality conscious. To make any program successful, you will have to know and understand the QA program and obtain the cooperation and participation of all your personnel. This requires you to ensure that all tests and repairs conform to their prescribed standards. In addition, you as a supervisor must train all of your personnel in quality control (QC).

QUALITY ASSURANCE PROGRAM

The QA program was established to provide personnel with information and guidance necessary to administer a uniform policy of maintenance and repair of ships and submarines. The QA program is intended to impart discipline into the repair of equipment, safety of personnel, and configuration control; thereby enhancing the ship's readiness.

The various QA manuals set forth minimum QA requirements for both the surface fleet and the submarine force. If more stringent requirements are imposed by higher authority, such requirements take precedence. If conflict exists between the QA manual and previously issued letters and transmittals by the appropriate force commander, the QA manual takes precedence. Such conflicts should be reported to the appropriate officials.

The instructions contained in the QA manual apply to every ship and activity of the force. Although the requirements apply primarily to the repair and maintenance done by the force intermediate maintenance activities (IMAs), they also apply to maintenance done aboard ship by the ship's force. In all cases, specifications must be met. If specifications cannot be met, a departure from specifications request must be completed and reported. This will be discussed later in the chapter.

Because of the wide range of ship types and equipment and the varied resources available for maintenance and repair, the instructions set forth in the QA manual are necessarily general in nature. Each activity must implement a QA program to meet the intent of the QA manual. The goal should be to have all repairs conform to QA specifications.

PROGRAM COMPONENTS

The basic thrust of the QA program is to ensure that you comply with technical specifications during all work on ships of both the surface force and the submarine force. The key elements of the program are as follows:

1. Administration. This includes training and qualifying your personnel, monitoring and auditing programs, and completing the QA forms and records.
2. Job Execution. This includes preparing work procedures, meeting controlled material requirements, requisitioning material, conducting in-process control of fabrication and

repairs, testing and recertifying, and documenting any departure from specifications.

CONCEPTS OF QUALITY ASSURANCE

The ever-increasing technical complexity of present-day surface ships and submarines has spawned the need for special administrative and technical procedures known collectively as the QA Program. The program's concept is fundamentally the prevention of defects. This encompasses all events from the start of maintenance operations until their completion and is the responsibility of all maintenance personnel. Achievement of QA depends on preventing maintenance problems through your knowledge and special skills. As a supervisor, you must consider QA requirements whenever you plan maintenance. The fundamental rule for you to follow for all maintenance is that **TECHNICAL SPECIFICATIONS MUST BE MET AT ALL TIMES.**

Prevention is concerned with regulating events rather than being regulated by them. It relies on eliminating maintenance failures before the y happen. This extends to safety of personnel, maintenance of equipment, and virtually every aspect of the total maintenance effort.

Knowledge is obtained from factual information. Quality assurance knowledge is acquired through the proper use of data collection and analysis programs. The maintenance data collection system provides maintenance managers with unlimited quantities of factual information. Their correct use of this information provides them with the knowledge required to achieve maximum readiness of aircraft and weapon systems.

Special skills, normally not possessed by production personnel, are required by a staff of trained personnel who analyze data and supervise QA programs.

The QA program provides an efficient method for gathering and maintaining information on the quality characteristics of products and on the source and nature of defects and their impact on the current operation. It permits decisions to be based on facts rather than on intuition or memory. It provides comparative data that will be useful long after the details of particular times or events have been forgotten. Quality assurance requires that certain individuals have both the authority and the responsibility for overseeing QA related actions.

A properly functioning QA program points out problem areas to maintenance managers so they can take appropriate action to accomplish the following:

1. Improve the quality, uniformity, and reliability of the total maintenance effort
2. Improve the work environment, tools, and equipment used in the performance of maintenance
3. Eliminate unnecessary man-hour and dollar expenses
4. Improve the training, work habits, and procedures of maintenance personnel
5. Increase the excellence and value of reports and correspondence originated by the maintenance activity
6. Distribute required technical information more effectively
7. Establish realistic material and equipment requirements in support of the maintenance effort

To obtain full benefits from a QA program, teamwork must be achieved first. Blend QA functions with the interest of the total organization and you produce a more effective program. Allow each worker and supervisor to use an optimum degree of judgment in the course of assigned daily work; a person's judgment plays an important part in the quality of his or her work Quality assurance techniques supply each person involved with a job with information concerning actual product quality. This information provides a challenge to the person to improve the quality of the work. The resulting knowledge encourages the best efforts of all your maintenance personnel.

Quality assurance is designed to serve both management and production equally. Management is served when QA monitors the complete maintenance effort of the department, furnishes factual feedback of discrepancies and deficiencies, and provides the action necessary to improve the quality, reliability, and safety of maintenance. Production is served by having the benefit of collateral duty inspectors formally trained in inspection procedures; it is also served in receiving technical assistance in resolving production problems. Production personnel are not relieved of their basic responsibility y for quality work when you introduce QA to the maintenance function. Instead, you increase their responsibility by adding accountability. This accountability is the essence of QA.

GOALS

The goals of the QA program are to protect personnel from hazardous conditions, increase the time between equipment failure, and ensure the proper repair of failed equipment. The goals of the QA program are intended to improve equipment reliability, safety of personnel, and configuration control. Achievement of these goals will ultimately enhance the readiness of ship and shore installations. There is a wide range of ship types and classes in the fleet, and there are equipment differences within ship classes. This complicates maintenance support and increases the need for a formalized program that will provide a high degree of confidence that overhaul, installations, repairs, and material will consistently meet conformance standards.

THE QA LINK TO MAINTENANCE

What does QA have to do with repair work? Accomplishment of repairs and alterations according to technical specifications has been a long-standing requirement in U.S. Navy ships. Ultimate responsibility to ensure this requirement is met rests with the person performing the maintenance. To do the job, a worker must be

1. properly trained,
2. provided with correct tools and parts,
3. familiar with the applicable technical manuals and plans, and
4. adequately supervised.

These elements continue to be the primary means of assuring that maintenance is performed correctly. As a supervisor, you can readily see where you fit in.

Once the need for maintenance is identified, you must consider QA requirements concurrently with the planning and performing of that maintenance. Technical specifications will come from a variety of sources, and determining which specifications apply to the particular job will be the most difficult part of your planning effort. Once you make that determination, the maintenance objective becomes two-fold:

1. Ensure that the maintenance effort meets all specifications.
2. Ensure that the documentation is complete, accurate, and auditable.

If you consider the philosophy of QA, you will find it is unique in that it does not recognize degrees of success. Quality assurance is a pass-fail process! In our educational system, a student who is 95 percent correct in answering exam questions walks home with straight A's. By contrast, if one of your workers is not 95 percent correct in meeting maintenance standards, he or she has not only failed miserably, but has guaranteed that the work must be redone. This will cost you additional time, effort, and money. It is vital that you approach maintenance planning from the standpoint of first-time quality.

THE QUALITY ASSURANCE ORGANIZATION

The QA program for naval forces is organized into different levels of responsibility. For example, the COMNAVSURFPAC QA program is organized into the following levels of responsibility: type commander, readiness support group/area maintenance coordinator, and the IMAs. The QA program for the submarine force is organized into four levels of responsibility-type commander, group and squadron commanders, IMA commanding officers, and ship commanding officer/officers in charge. The QA program for Naval Surface Force for the Atlantic Fleet is organized into five levels of responsibility–force commander, audits, squadron commanders, IMAs, and force ships.

The QA program organization (Navy) begins with the **commanders in chief of the fleets,** who provide the basic QA program organization responsibilities and guidelines.

The **type commanders (TYCOMs)** provide instruction, policy, and overall direction for implementation and operation of the force QA program. Type commanders have a force QA officer assigned to administer the force QA program.

The **commanding officers (COs)** are responsible to the force commander for QA in the maintenance and repair of their ships. The CO is responsible for organizing and implementing a QA program within the ship to carry out the provisions of the TYCOM's QA manual. Quality assurance is a collateral duty assignment except where the manpower authorization provides QA billets.

The CO ensures that all repair actions performed by ship's force conform to provisions of the QA manual as well as to other pertinent technical requirements. (Level I certified ships maintain continuity of Level I [nuclear and non-nuclear] certification during the operating cycle and assure that all repair actions performed within Level I boundaries are completed and documented as set forth by the QA manual.)

The CO ensures that all work requests requiring special controls are properly identified and that applicable supporting documentation is provided to the maintenance or repair activity using the applicable QA form.

The CO also ensures that departures from specifications are reported, required audits are conducted, and adequate maintenance is performed for the material condition necessary to support continued unrestricted operations.

The **quality assurance officer (QAO)** is responsible to the commanding officer for the organization, administration, and execution of the ship's QA program according to the QA manual.

The QAO is responsible for the following:

- Coordinating the ship's QA training program.
- Ensuring that QA training becomes an integral part of the ship's training program.
- Maintaining ship's QA records and test and inspection reports.
- Maintaining auditable departure from specifications records, and reviewing procedures and controlled work packages prepared by the ship.
- Conducting QA audits as required, and following up on corrective actions to ensure compliance with the QA program.
- Preparing QA/QC (quality assurance/quality control) reports to higher authority.

The **ship's quality control inspectors (SQCIs),** usually work center supervisors and two others from the work center, must have a thorough understanding of the QA program. Some of the other responsibilities an SQCI will have are as follows:

- Inspect all work for conformance to specifications.
- Train personnel in QC.
- Maintain ship records to support the QA program.
- Ensure that only calibrated equipment is used in acceptance testing and inspection of work.
- Initiate departure from specification reports (discussed later) when required.
- Ensure that all inspections beyond the capabilities of the shop's QA inspector are performed and accepted by IMA prior to final acceptance and installation of the product by the ship.
- Witness and document all tests.
- Ensure that all materials or test results that fail to meet specifications are recorded and reported.
- Report all deficiencies and discrepancies to the ship's QA coordinator (keeping the division officer informed).
- Develop controlled work packages for all ship repair work requiring QA controls.

More on SQCI duties will be discussed later in this chapter, because this will more than likely be the area you will be associated with.

RESPONSIBILITIES FOR QUALITY OF MAINTENANCE

Although the CO is responsible for the inspection and quality of material within a command, he or she depends on the full cooperation of all hands to meet this responsibility. The responsibility for establishing a successful program to attain high standards of quality workmanship cannot be discharged by merely creating a QA division within a maintenance organization. To operate effectively, this division requires the full support of everyone within the organization. It is not the instruments, instructions, and other facilities for making inspections that determine the success or failure in achieving high standards of quality; it is the frame of mind of all personnel.

Quality maintenance is the name of the game. You, as a supervisor, must know that high-quality work is vital to the effective operation of any maintenance organization. To achieve this high quality work each of your personnel must know not only a set of specification limits, but also the purpose of those limits.

The person with the most direct concern for quality workmanship is you–the production supervisor. This stems from your responsibility for the proper professional performance of your assigned personnel. You must establish procedures within the work center to ensure that all QA inspection requirements are complied with during all maintenance evolutions. In developing procedures for your work center, keep in mind that

inspections normally fall into one of the three following inspection areas:

1. **RECEIVING OR SCREENING INSPECTIONS.** These inspections apply to material, components, parts, equipment, logs and records, and documents. These inspections determine the condition of the material, proper identification of each item, maintenance requirements, disposition, and correctness of accompanying records and documents.

2. **IN-PROCESS INSPECTIONS.** These inspections are specific QA actions that are required during maintenance or actions in cases where satisfactory task performance cannot be determined after maintenance has been completed. These inspections include witnessing, application of torque, functional testing, adjusting, assembling, servicing, and installation.

3. **FINAL INSPECTIONS.** These inspections comprise specific QA actions performed following the completion of a task or series of tasks. QA inspection of work areas following task completion by several different personnel is an example of a final inspection.

SHIP QUALITY CONTROL INSPECTOR (SQCI)

The inspector is the front line guardian of adherence to quality standards. In the shops and on the deck plates, the SQCIs must constantly remind themselves that they can make a difference in the quality of a product. They must be able to see and be recognized for their contributions in obtaining quality results.

As a work center supervisor, you will be responsible for the QA program in your work spaces. You must realize that QA inspections are essential elements of an effective QA program. You are responsible to your division officer and the QAO for coordinating and administering the QA program with your work center. You are responsible for ensuring that all repaired units are ready for issue. This doesn't mean you have to inspect each item repaired in your shop personally; you should have two reliable, well-trained technicians to assist you in QA inspections. To avoid the many problems caused by poor maintenance repair practices or by replacement of material with faulty or incorrect material, you must take your position as an SQCI very seriously. When you inspect a certain step of an installation, ensure to the utmost of your knowledge and ability that the performance and product meet the required specifications and that installations are correct.

Most commands that have a QA program will issue you a special card that will identify you as a qualified SQCI for your command. Each of your shop SQCIs will also be assigned a personal serial number by the QAO, as proof of certification. Each of them should use this serial number on all forms and tags that require initials as proof that certified tests and inspections were made. This will provide documented proof and traceability that each item or lot of items meets the material and workmanship for that stage of workmanship. Also, you will be given a QCI stamp so that you can stamp the QCI certification on the forms or tags as a checkoff of a particular progressive step of inspection or final job completion. The stamp will also serve as proof of inspection and acceptance of each satisfactory shop end product. This stamp may have your command identification and a QCI number that is assigned and traceable to you.

As an SQCI, you should be thoroughly familiar with all aspects of the QA program and the QC procedures and requirements of your specialty.

You will be trained and qualified by the QAO according to the requirements set forth by your applicable QA manual and the quality control requirements applicable to your installation. The QAO will interview you to determine your general knowledge of QA and your attitude toward the QA discipline. You will have to pass a written examination and also demonstrate knowledge of records, report completion, and final requirements.

You will report to the appropriate QA supervisors while keeping your division officer informed of matters pertaining to QA work done in the shop. You and your other work center QCIs will be responsible for the following:

1. Developing a thorough understanding of the QA program.

2. Ensuring that all shop work performed by your work center personnel meets the minimum requirements set forth in the latest plans, directives, and specifications of higher authority and that controlled work packages (CWPs) are properly used on repair work.

3. Ensuring that all work center personnel are familiar with applicable QA manuals by conducting work center/division training,

4. Maintaining records and files to support the QA program, following the QA manual.
5. Assuring that your work center and, when applicable, division personnel do not use measuring devices, instruments, inspection tools, gauges, or fixtures for production acceptance and testing that do not have current calibration stickers or records attached or available.
6. Performing quality control inspections of each product manufactured or repaired by your work center.
7. Assisting your division oficcer and QAO in conducting internal audits as required and taking corrective action on noted discrepancies.

Alternate SQCIs are usually assigned as backups to the regular SQCIs. Their qualifications and responsibilities are the same as those of the regularly assigned SQCI.

WORK CENTER CONTROLLED MATERIAL PETTY OFFICERS (CMPO)

As a supervisor you must also ensure that procedures governing controlled material are followed. You can do this by having one or more of your work center personnel trained in the procedures for inspecting, segregating, stowing, and issuing controlled material. When they have completed their training, designate them as controlled material petty officers (CMPOs).

SHOP CRAFTSMAN

As stated earlier, the person doing the work, whether it be manufacturing or repairing, is responsible for following all written guidelines. He or she is responsible to you when questions arise about the work being performed. Ensure that your workers know to stop and seek work instructions or clarification from you when questions or conditions arise which may impede the successful completion of the task or job.

A good lesson to teach over and over to all your workers is to strive to achieve first-time quality on every assigned task. This will not only instill pride and professionalism in their work but will also help ensure a quality product.

QUALITY ASSURANCE REQUIREMENTS, TRAINING AND QUALIFICATION

A comprehensive training program is the next step in an effective QA program. For inspectors to make a difference, they must be both trained and certified. They must have formal or informal training in inspection methods, maintenance and repair, and certification of QA requirements. Costly mistakes, made either from lack of knowledge or improper training, can be entirely eliminated with a good QA training program at all levels of shop or work group organization. Before personnel can assume the responsibility of coordinating, administering, and executing the QA program, they must meet certain requirements. Personnel assigned to the QA division or quality control personnel you have assigned in your work center, such as SQCIs, CMPOs, or their alternates, should be highly motivated toward the QA program. It is imperative that a qualification and requalification program be established for those personnel participating in the program. Where military standards and NAVSEA technical documents require formal technical training or equivalent, those requirements must be met and personnel qualification vigorously and effectively monitored to ensure that qualifications are updated and maintained. When formal training for a specific skill is not a requirement, the guidelines of the QA manual maybe used as a basis for training to ensure that personnel are provided with the necessary expertise to perform a required skill. Personnel who obtain a QA qualification must undergo periodic QA training and examinations, both oral and written, to maintain the qualification. We will discuss this procedure in the following paragraphs.

QUALITY ASSURANCE OFFICER

The QAO is an individual whose primary duty, assigned by the commanding ofllcer in writing, is to oversee the QA program. The QAO ensures that personnel assigned to perform QA functions receive continuous training in inspecting, testing, and quality control methods specifically applicable to their area of assignment. The QAO also ensures that SQCIs receive cross training to enable them to perform QA functions outside their assigned areas. This training includes local training courses, on-the-job training (OJT), rotation of assignments, personnel qualification standards (PQS), and formal schools.

Whenever possible, the QAO receives formal training according to the QA manual. He or she is responsible to the repair officer for planning and

executing a QA training program for the various qualifications required for QA. The QAO personally interviews each perspective SQCI to ensure that the person has a thorough understanding of the QA mission.

REPAIR OFFICER (RO)

The RO maintains qualified personnel in all required ratings for the QA program in his or her department. He or she also ensures that personnel assigned to the repair department are indoctrinated and trained in QA practices and requirements.

DIVISION OFFICERS

Division officers ensure that their divisional personnel receive training and are qualified in the QA process and maintain those qualifications. They make sure that all repairs, inspections, and production work requiring a witness are witnessed by division work center QC inspectors and that all test records are completed and signed. Division officers ensure that all test personnel observe all safety precautions pertaining to the specific equipment and wear personal safety equipment at all times while conducting these evolutions. They also make sure that test equipment, if required, is properly calibrated and that adequate overpressure protection is provided during tests in division spaces.

QUALITY ASSURANCE SUPERVISORS

Quality assurance supervisors are senior petty officers who have been properly qualified according to the QA manual. They have a thorough understanding of the QA function and are indoctrinated in all aspects of those coordinating, administering, and auditing processes of the QA program. Quality assurance supervisors train all SQCIs and CMPOs and ensure their recertification upon expiration of qualifications. Quality assurance supervisors also administer written examinations to all perspective SQCIs and to SQCIs who require recertification to ensure a thorough understanding of the QA program.

SHIP QUALITY CONTROL INSPECTORS

SQCIs are trained by the QA supervisors in matters pertaining to the QA program. An inspector must be equally as skilled as the craftsman whose work he or she is required to inspect. Not only should the inspector know the fabrication or repair operation and *what workers are required to do,* but also *how to go about doing it.*

To recognize a product quality characteristic, the SQCI must be given certain tools and training. Tools of their trade should include measuring devices and documentation. Their training is both formal (documented course of instruction) and informal (OJT). They must pass a written test given by the QA supervisors, as well as an oral examination given by the QAO. The written exam includes general requirements of the QA program and specific requirements related to their particular specialty. Successful completion of the shop qualification program course for QC inspectors will fulfill this requirement. The QA supervisor may also administer a practical examination to perspective SQCIs in which they will have to demonstrate knowledge of records and report completion, and filing requirements. This will ensure that the SQCIs have a general knowledge of and a proper attitude toward the QA program.

CONTROLLED MATERIAL PETTY OFFICERS

CMPOs are normally petty officers, E-4 or E-5, who are thoroughly familiar with controlled material requirements as outlined in the QA manual. They, too, are trained and qualified by a QA supervisor. The QAO will interview them, as he or she did for SQCIs, to see if they have a general knowledge of controlled material requirements.

The QA supervisor will give them a written test to ensure that they have sufficient knowledge of controlled material requirements and procedures to carry out their responsibilities effectively.

OPERATION OF A QUALITY ASSURANCE PROGRAM

Initiating an effective, ongoing QA program is an all-hands effort. It takes the cooperation of all shop personnel to make the program work. As the shop or work group supervisor, you will be responsible for getting the program rolling.

The key elements are a good personnel orientation program, a comprehensive personnel training program, use of the proper repair procedures, and uniform inspection procedures. When you have organized the shop or work center and placed all these elements in practice, your QA program will be underway. These elements are discussed in the following paragraphs.

PERSONNEL ORIENTATION

The best way to get the support of your personnel is to show them how an effective QA program will benefit them personally. Eliminating or reducing premature failures in repaired units and introducing high-reliability repairs will appreciable y reduce their workload, saving them frustration and enhancing the shop's or work group's reputation. This program, as with any new program or change to an existing program, will probably meet with opposition from some shop personnel. By showing your shop personnel the benefits of a QA program, you greatly reduce opposition to the change.

REPAIR PROCEDURES

Repair procedures may be defined as all of the action required to return an equipment to its proper operating condition after a defect has been discovered. Repair procedures include parts handling, disassembly, component removal or replacement, and assembly. Strictly adhering to the proper repair procedures will almost entirely eliminate premature failures. You, as shop supervisor or work group supervisor, and subordinate work center supervisors are responsible for ensuring that the proper procedures are used in handling all repairable units.

QUALITY ASSURANCE TERMS AND DEFINITIONS

As a supervisor, you need to be able to talk to your personnel about quality assurance and have them be able to carry out your instructions promptly and properly. You need to promote the use of words and phrases pertaining to quality and related programs, thus improving the clarity in your communication with them about QA. To do this, you need to understand the terms frequently used throughout the QA program. Each TYCOM's QA manuals and MIL-STD-109 have a complete list of these terms, but the most frequently used terms are listed here:

- **Quality assurance.** Quality assurance (QA) is a system that ensures that materials, data, supplies, and services conform to technical requirements and that repaired equipments perform satisfactorily.
- **Quality control.** Quality control (QC) is a management function that attempts to eliminate defective products, whether they are produced or procured.
- **Acceptance.** Acceptance is when an authorized representative approves specific serves rendered (such as a repair or manufactured part).
- **Calibration.** This is the comparison of two instruments or measuring devices, one of which is a standard of known accuracy traceable to national standards, to detect, correlate, report, or eliminate by adjustment any discrepancy in accuracy of the instrument or measuring device being compared with the standard.
- **Inspection.** This is the examination and testing of components and services to determine whether they conform to specified requirements.
- **In-process inspection.** This type of inspection is performed during the manufacture and repair cycle to prevent production defects. It is also performed to identify production problems or material defects that are not detectable when the job is complete.
- **Inspection record.** Inspection records contain data resulting from inspection actions.
- **Specifications.** A specification is any technical or administrative directive, such as an instruction, a technical manual, a drawing, a plan, or a publication, that defines repair criteria.
- **Audit.** An audit, as it applies to the QA program, is a periodic or special evaluation of details, plans, policies, procedures, products, directives, and records necessary to determine compliance with existing requirements.
- **Certified (Level I) material.** This is material that has been certified (as to its material and physical properties, as well as traceability to the manufacturer) by a qualified certification activity. This material has a material and identification control (MIC) number assigned along with a certification document.
- **Controlled material.** This is any material that must be accounted for and identified throughout the manufacturing or repair process. (See level of essentiality).
- **Controlled work package.** A controlled work package (CWP) is an assemblage of documents identified by a unique serial number that may contain detailed work procedures, purchase documents, receipt inspection reports, objective quality evidence, local test results, and any tags,

papers, prints, plans, and so on, that bear on the work performed. This will be discussed later in the chapter.

- **Departure from specifications.** This is a lack of compliance with any authoritative document, plan, procedure, or instruction. A detailed discussion will follow later in the chapter.
- **Documentation.** This is the record of objective evidence establishing the requisite quality of the material, component, or work done.
- **Level of essentiality.** A level of essentiality is a certain level of confidence required in the reliability of repairs made. The different levels of essentiality will be discussed later in the chapter.
- **Procedure.** A procedure is a written instruction designed for use in production and repair, delineating all essential elements and guidance necessary to produce acceptable and reliable products.
- **Process.** This is a set of actions written in a special sequential order by which a repair or maintenance action, a test, or an inspection is done using specific guidelines, tools, and equipment.
- **Reliability.** Reliability means the probability that an item will perform its intended function for a specified interval under stated conditions.
- **SUBSAFE.** The acronym SUBSAFE is a shorthand reference to the Submarine Safety Program, which provides a high level of confidence in the material conditions of the hull integrity boundary. SUBSAFE will be discussed later in the chapter.

THE CONTROLLED WORK PACKAGE

To provide additional assurance that a quality product will result from the in-process fabrication or repair, the controlled work package (CWP) was developed. It provides QC techniques (requirements or procedures) and shows **objective quality evidence** (documentation) of adherence to specified quality standards. These requirements or procedures include both external (type commander) and internal (command-generated) information for work package processing and sign-off. The typical CWP that will arrive at your desk will have QA forms, departure from specifications forms, material deficiency forms, production task control forms, and QC personnel sign-off requirements. You, and all the other work centers involved in the performance of the task, must review the contents of each package as well. When you review the package, check that the requirements specified for their accomplishment are correct, in a correct sequence, and soon. Each CWP covers the entire scope of the work process and is able to stand on its own. Traceability from the work package to other certification documentation is provided by the job control number (JCN).

You must ensure that the CWP is at the job site during the performance of the task. If the work procedure requires the simultaneous performance of procedure steps and these steps are done in different locations, use the locally developed practices to ensure that you maintain positive control for each step.

Immediately after a job is completed but before the tended unit gets underway, each assigned work center and the QAO will review the work package documentation for completeness and correctness. If you and your workers have been doing the assigned steps as stated, this should not be a problem. Ensure that all the verification signature blocks are signed. Make sure all references, such as tech manuals or drawings, are returned to the appropriate place.

Enclosures

You will find a lot of documentation inside the CWP when it arrives at your desk. Inside will be process instructions, plans, technical drawings, and instructions pertinent to the production job at hand. Documents listed as references are not included in the CWP but must be available when required. You will also find a copy of applicable portions of references included in the CWT. The 4790/2R, Automated Work Request, is included in the CWP to provide complete documentation and reference back to the originating tended unit. You will use all of the documentation to perform the maintenance action, production task, or process assigned to your work center.

Revisions

You can make minor corrections to the work procedure (as directed by local instructions) as long as they do not change the scope of the work being performed. However, if you need to change the original scope of the job, such as working on a part not originally intended to be worked on, you must initiate a **revision.** The revision cover sheet gives exact instructions on

adding, deleting, or changing steps in the work sequence.

Addendums

Depending on the complexity of the task, it may be desirable to have two or more work centers working portions of the task concurrently. If so, Planning and Estimating (P&E) will initiate an addendum to the original CWP. The addendum will include all the headings of the CWP-references, material list, safety requirements, work sequence, and so forth. When you complete the work steps, include the addendum(s) with the CWP.

LEVELS OF ESSENTIALITY, ASSURANCE, AND CONTROL

To provide your customers both repair quality and quality assurance, you as a supervisor and your maintenance personnel must understand and appreciate them and their operational environment. This will require that you and your personnel give serious thought and consideration to how a system's nonperformance may endanger personnel safety and threaten the ship's mission capability. For example, you are not going to be aboard the submarine as it does its deep dive to test hull integrity (and your hull packing work). You must stress to your workers how system essentiality, in an operation environment, equates with mission capability and personnel safety. In other words, workers must understand how the work they perform in a maintenance or repair environment can seriously affect the operational capabilities of the tended unit as well as the safety of the personnel aboard the unit. This is where the assigned levels of essentiality, assurance, and control come into play. What do we mean by these terms? We will discuss each in the following paragraphs.

LEVELS OF ESSENTIALITY

A number of early failures in certain submarine and surface ship systems were traced to use of the wrong material. This led to a system for prevention involving levels of essentiality. A level of essentiality is simply a range of controls in two broad categories representing a certain high degree of confidence that procurement specifications have been met. These categories are

1. verification of material, and
2. confirmation of satisfactory completion of tests and inspections required by the ordering data.

Levels of essentiality are codes, assigned by the ship according to the QA manual, that indicate the degree to which the ship's system, subsystem, or components are necessary or indispensable in the performance of the ship's mission. Levels of essentiality also indicate the impact that catastrophic failure of the associated part or equipment would have on the ship's mission capability and personnel safety.

LEVELS OF ASSURANCE

Quality assurance is divided into three levels: A, B, C. Each level reflects certain quality verification requirements of individual fabrication in process or repair items. Here, verification refers to the total of quality of controls, tests and inspections. **Level A** assurance provides the most stringent or restrictive verification techniques. This normally requires both quality controls and test or inspection methods. **Level B** assurance provides adequate verification techniques. This normally requires limited quality controls and may or may not require tests or inspections. **Level C** assurance provides minimum or "as necessary" verification techniques. his normally requires very little quality control or tests or inspections.

LEVELS OF CONTROL

Quality control may also be assigned generally to any of the three levels–A, B, or C. Levels of control are the degrees of control measures required to assure reliability of repairs made to a system, subsystem, or component. Furthermore, **levels of control** (quality control techniques) are the means by which we achieve **levels of assurance.**

An additional category, which you will see when you work on periscopes, is Level I. This is reserved for systems that require **maximum confidence** that the composition of installed material is correct.

CONTROLLED MATERIAL

Some material, as part of a product destined for fleet use, has to be systematically controlled from procurement through receipt, stowage, issue, fabrication, repair, and installation to ensure both quality and material traceability. Controlled material is any material you use that must be accounted for (controlled) and identified throughout the manufacturing and repair process, including installation, to meet the specifications required of the end product. Controlled material must be inspected by your CMPO for required attributes before you can use it in a system or component

and must have inspection documentation maintained on record. You must retain traceability through the repair and installation process. It requires special marking and tagging for identification and separate storage to preclude loss of control. The RO may designate as controlled material any material that requires material traceability.

Under this definition, controlled material has two meanings. The first meaning applies to items considered critical enough to warrant the label of controlled material. Your CMPOs will be responsible for inspecting the material when it is received, stowing it separately from other material, providing custody, and seeing that controlled assembly procedures are used during its installation. The term *controlled material* is used in reference to material either labeled **"SUBSAFE"** or classed in one of the three levels of essentiality. (Strictly speaking, **SUBSAFE** is not a level of essentiality.)

SUBSAFE

To help you understand SUBSAFE, we will discuss a little of the background of the program. The Submarine Safety Program (hence, the SUBSAFE) was established in 1963 as a direct result of the loss of the USS *THRESHER*. The program is two-fold, consisting of both **material** and **operability** requirements. It provides a high level of confidence in the material conditions of the hull integrity boundary and in the ability of the submarines to recover from control surface casualties and flooding.

SUBSAFE requirements are split into five categories, which are devoted to

1. piping systems,
2. flooding control and recovery.
3. documentation,
4. pressure hull boundary, and
5. government-furnished material.

There are three SUBSAFE definitions you need to consider: SUBSAFE system, SUBSAFE boundary, and SUBSAFE material.

SUBSAFE System

This is any submarine system determined by NAVSEA to require the special material or operability requirements of the SUBSAFE program. How does it concern you? After you have installed a system, it must prevent flooding of the submarine, enhance recovery in the event of flooding, and ensure reliable ship control.

SUBSAFE Boundary

A SUBSAFE boundary marks the specific portion of a SUBSAFE system within which the stringent material or operability requirements of SUBSAFE apply.

SUBSAFE Material

Within the SUBSAFE boundary, two different sets of requirements apply-SUBSAFE and Level I. What is the difference between the two? The difference is expressed by two words, *certification* and *verification*. Material certification pertains to the SUBSAFE program. This means that an item certified as SUBSAFE meets a certain testing or fabrication requirement and can be used as intended in a critical hull integrity or pressure-containing role. On the other hand, material verification pertains to the Level I program. An item specified as Level I has had its material composition tested and verified. This testing and verification ensures traceability from the material back to a lot or batch to ensure that its material composition complies with procurement specifications.

DEPARTURE FROM SPECIFICATION

Specifications are engineering requirements such as type of material, dimensional clearances, and physical arrangements, by which ship components are installed, tested, and maintained. All ships, surface and submarine, are designed and constructed to specific technical and physical requirements. As a supervisor, you must ensure that your personnel make every effort to maintain all ship systems and components according to published specifications. What do you do if a specification cannot be met? Don' t panic! There are, on occasion, situations in which specifications cannot be met. In such cases, the system or component is controlled with a deviation from specification. To maintain precise control of a ship's technical configuration, any deviation you make must be recorded and approved as a departure from specification.

DEFINING A DEPARTURE FROM SPECIFICATION

Plainly put, a departure from specification is a lack of compliance with an authoritative document, plan, procedure, or instruction. As a minimum, departures are required when the following situations recur:

1. There is a lack of compliance with cognizant technical documents, drawings, or work

procedures during a maintenance action that will not be corrected before the ship gets underway.

2. There is a lack of compliance wit specifications for "as found" conditions during maintenance action for which no prior action is held (such as a shipyard waiver), which will not be corrected prior to the ship getting underway.

3. There is a lack of compliance with a specification discovered and no corrective action is planned.

A departure from specification is not required for nonconforming conditions discovered and not caused by maintenance or a maintenance attempt. Specifically, for items that routinely fail and for which corrective action is planned only a CSMP entry is made. A departure from specification should not be generated.

A SUPERVISOR'S LINK TO REPORTING PROCEDURES

Why do we report and ensure that our workers report all departures from specifications? Is it because we need more paperwork? You and your workers who perform maintenance have an obligation to perform every repair according to specifications. When a departure is discovered, it is the responsibility of the person(s) finding it to report it. However, since you cannot be everywhere, how can you make sure your workers report the departure? As you will see, your supervisory role plays a big part in ensuring that workers always comply.

There are several reasons why workers may fail to report departures from specifications. Some workers feel that specifications are only objectives rather than minimum requirements for acceptability. You must stress to all of your workers that any deviation from specifications must be recorded, reviewed, and approved by the proper authority. Another reason, which has a direct link to supervisors, is lack of adequate inspection, quality control, and management of the process for determining compliance with specifications. Sometimes workers simply do not understand the specification requirements. Do they really understand what is expected on the job? Another reason is a lack of training in the skills necessary to meet specifications. Do you have the right person on the job? Was the job a rush job? A lack of time for adequate planning and parts procurement, thereby requiring an emergency temporary repair in lieu of a permanent repair, is another reason why workers may fail to comply with specifications. From this discussion, you can see the role you as a supervisor must play during this all-important process.

TYPES OF DEPARTURES FROM SPECIFICATIONS

There are two types of departures that affect you and the reporting procedure–major and minor. We will briefly discuss each of them in the following paragraphs.

Major Departures from Specifications

A major departure from specifications is any departure from specifications that affects the reliability of the ship's control systems, watertight integrity, or personnel safety. Major departures from specifications require approval from **higher authority.** If you have a departure from specifications that falls into any of the following categories, consider it a major departure:

1. Any departure that directly involves the safety of the ship or personnel
2. Any departure that reduces the integrity or operability of equipment essential to the ship's mission (for example, installation of parts that do not meet all applicable material certification requirements)
3. Failure to complete any required retest of a component or subsystem that, if defective, could cause flooding
4. Any nonconformance to plan specifications resulting in a change of configuration considered to be a permanent repair
5. Failure to meet all applicable standards for major repairs unless other alternatives are authorized by the QA manual (in other words, failed strength test)

Minor Departure from Specifications

This includes all departures that are not determined to be major. Minor departures may be permanent or temporary and are approved by the RO.

REPORTING PROCEDURES

Who reports a departure from specifications? Do you as the supervisor? Only if you are the one finding or causing the departure. As stated in the QA manual, the person **discovering** or **causing** the departure must initiate the departure from specifications. However, does this mean that each time we cause a departure we

immediately start the parer work? No! The originator must ensure that the departure is identified during fabrication, testing, or inspection of the completed work. He or she must make every effort to correct each deficiency **before** initiating the departure request. Work must not continue until the deficiency is corrected or the departure request is approved.

Now that we have identified a departure, what do we do with it? We go back to the originator. He or she must ensure that QA Form 12 is properly filled out and forwarded via the chain of command to the QAO.

The originator must also retain a copy of the prepared departure request until he or she receives the returned copy from the QAO indicating that all actions concerning the departure have been completed (approved or disapproved).

Make sure that the originator has an approved copy of the departure request accompanying the completed work and that the original copy is retained in the CWP.

QA FORMS AND RECORDS

The following are the titles and descriptions of the forms and records you will use the most. A rule to remember when using these forms is that all QA forms must be completed and signed in the proper sequence.

QA FORM 1, THE MATERIAL RECEIPT CONTROL RECORD

This record is used by the CMPO to document the proper receipt and inspection of items that have been designated as controlled materials.

QA FORM 2, MATERIAL IN-PROCESS CONTROL TAG

This tag is attached by supply, QA, or shop personnel to provide traceability of accepted controlled material from receipt inspection through final acceptance.

QA FORM 3, MATERIAL REJECT TAG

Shop personnel, supply, or QA personnel will attach this tag to rejected items. The individuals finding or causing the unacceptable condition attaches the tag to the rejected item. The tag indicates that the material is unacceptable for production work and must be replaced or reinspected before use.

QA FORM 4, SHIP-TO-SHOP TAG

This tag is used to identify and control material to be repaired. You attach the tag to the item to be repaired It is a good idea to stamp the three sections of the tag with a control number and log it in your shop log.

QA FORM 7, CONTROLLED MATERIAL INVENTORY/RECORD

This form is used by your CMPO to provide a standard inventory record of controlled material received and issued.

QA FORM 9, RE-ENTRY CONTROL FORM

This form is used to document re-entry into a SUBSAFE boundary and is used in a controlled work procedure.

QA FORM 17, TEST AND INSPECTION FORM-OTHER THAN NDT

QA Form 17 lists all the tests and inspections that must be performed at each step. A QA Form 17 must be completed and signed off before any step can be signed off on the QA Form 10.

QA FORM 34, TORQUE/CONTROLLED ASSEMBLY REPORT

This form consists of two enclosures: the torque sequence sketch and a QA Form 17 listing all of the required torque readings.

SUMMARY

The QA concept involves preventing the occurrence of defects. Quality assurance covers all events from the start of a maintenance action to its completion and is the responsibility of all maintenance personnel. In addition, organization of your workspaces, your ways of storing parts, and your relationships with the SKs all affect the quality of your product.

By carefully following the methods and procedures outlined in your QA program manuals and by paying careful attention to the quality of work in your area, you will contribute greatly to the operational effectiveness of both your ship and tended units.

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